

# Daylighting in Museums

Radiance Workshop 2005 – 11 August 2005, 9:30 a.m.

Matt Franks – Arup Lighting

# Overview

- **Why use daylight in museums?**
- **Conservation Considerations**
- **Lighting Considerations**
- **Case Studies:**
  - Rothko Chapel, Houston, Texas
  - Seattle Art Museum

# Why Use Daylight in Museums?

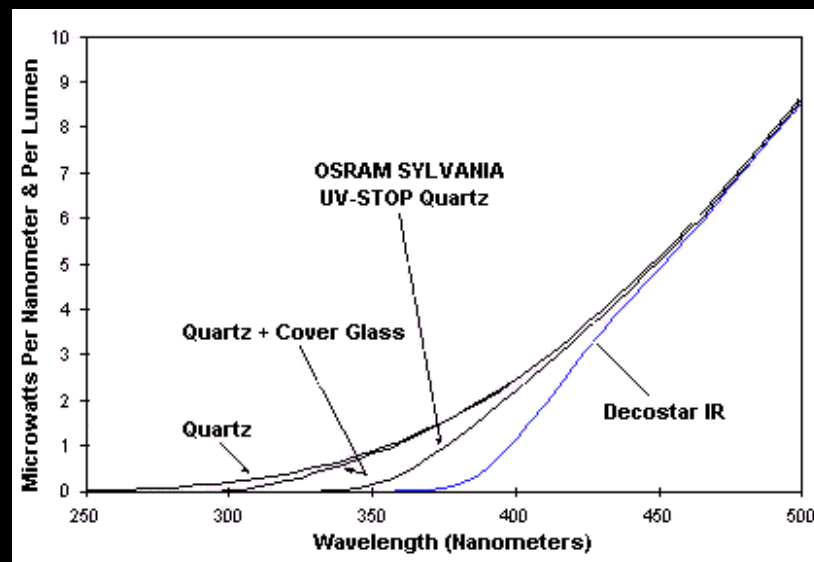
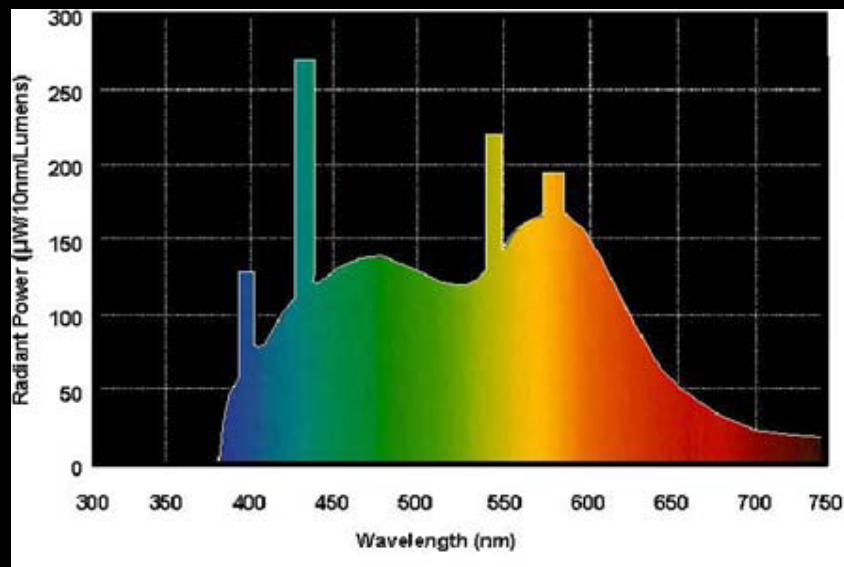
- **Better Color Rendering**
- **Fuller Spectrum**



*Foundation Beyeler, Switzerland*

# Why Use Daylight in Museums?

- Better Color Rendering
- Fuller Spectrum



# Why Use Daylight in Museums?

- **Connection to the outside**



*Tate Modern, London, UK*



*The Nasher Sculpture Center, Dallas, TX*

# Conservation Considerations

- **Exposure to sunlight**
- **Exposure to diffuse daylight**
- **Exposure to UV**

# Conservation Considerations - Direct Sunlight

- **Generally, all direct sunlight should be avoided.**
- **Shading systems can allow diffuse light and block all direct sunlight**



*High Museum of Art, Atlanta, Georgia*



*The Nasher Sculpture Center, Dallas, Texas*

# Conservation Considerations - Diffuse Daylight

<b>Works on Paper</b>	50 lux	Works on paper with colored media, Any media on a degraded support, Color photo prints and transparencies
	100 lux	Works on paper with black and white media only, Black and white photographs
<b>Paintings</b>	50 lux	Thinly covered paintings on unprimed canvas, Paintings in distemper media or gouache, miniatures
	150-200 lux	Oil and tempera paintings

Gary Thomson, *"The Museum Environment"*



# Conservation Considerations - Diffuse Daylight

<b>Objects</b>	50 lux	Objects with painted, dyed or polychromed surfaces, Upholstered furniture, Unstable glass
	200 lux	Objects made of material such as leather and wood
	1000-2000 lux	Objects made of inorganic material with unpainted surfaces such as stone, ceramic and metal

*Gary Thomson, "The Museum Environment"*

## Conservation Considerations - Diffuse Daylight

- **650,000 lux-hours maximum recommended for oil and tempera paintings and objects made of wood or leather**
- **150,000 lux-hours maximum recommended for textiles, colored works on paper, photographs**

# Conservation Considerations - Exposure to UV

- Limit by using UV filters in glazing



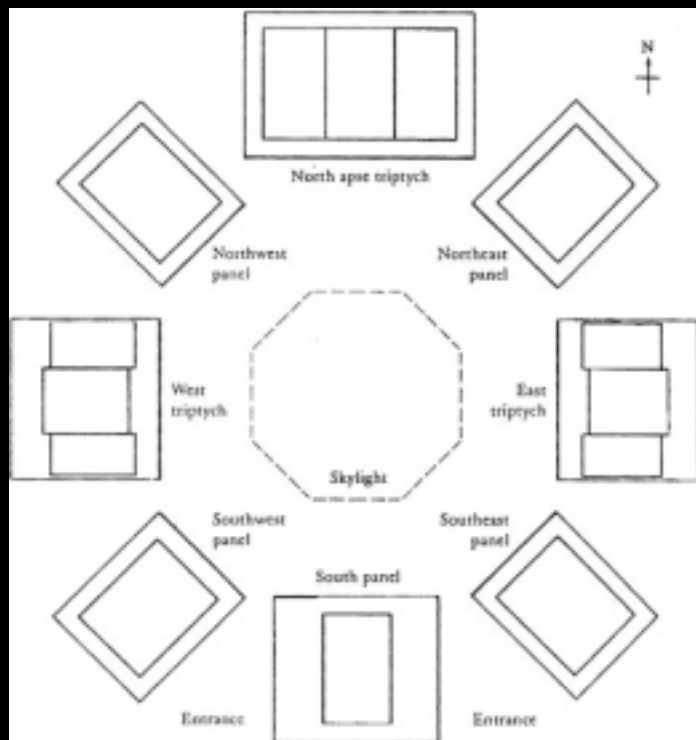
*High Museum of Art, Atlanta, Georgia*

# Lighting Design Considerations

- **Uniformity over vertical flat viewing surface - 2:1 average to minimum is ideal**
- **Uniformity for 3-D objects not as important**
- **Minimize glare by reducing reflections and bright surfaces such as unshielded lamps and windows**

# Rothko Chapel

- **Houston, Texas**
- **Commissioned design by Rothko with Philip Johnson**

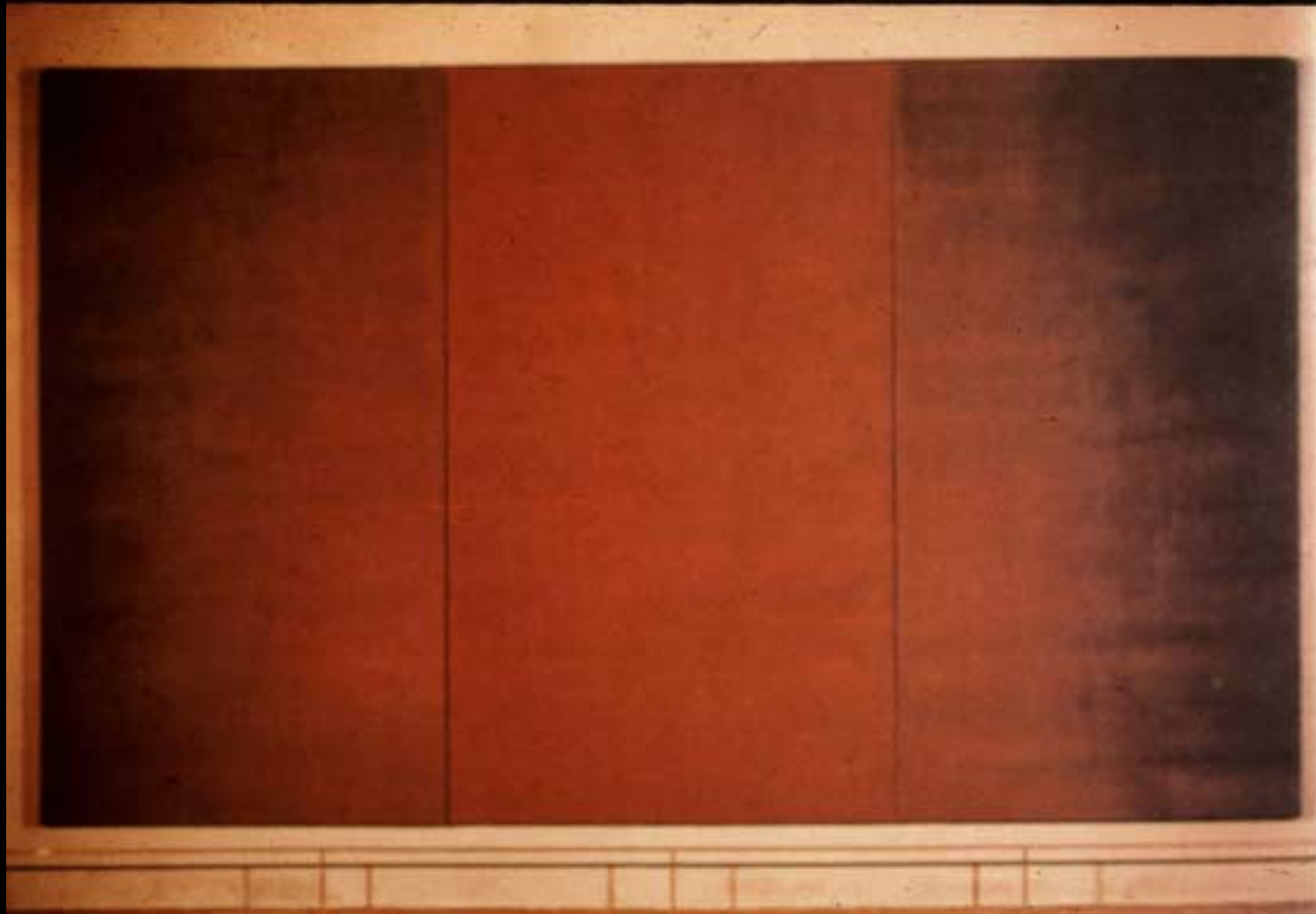


# Rothko Chapel

- **Original Design**



# Rothko Chapel



# Rothko Chapel





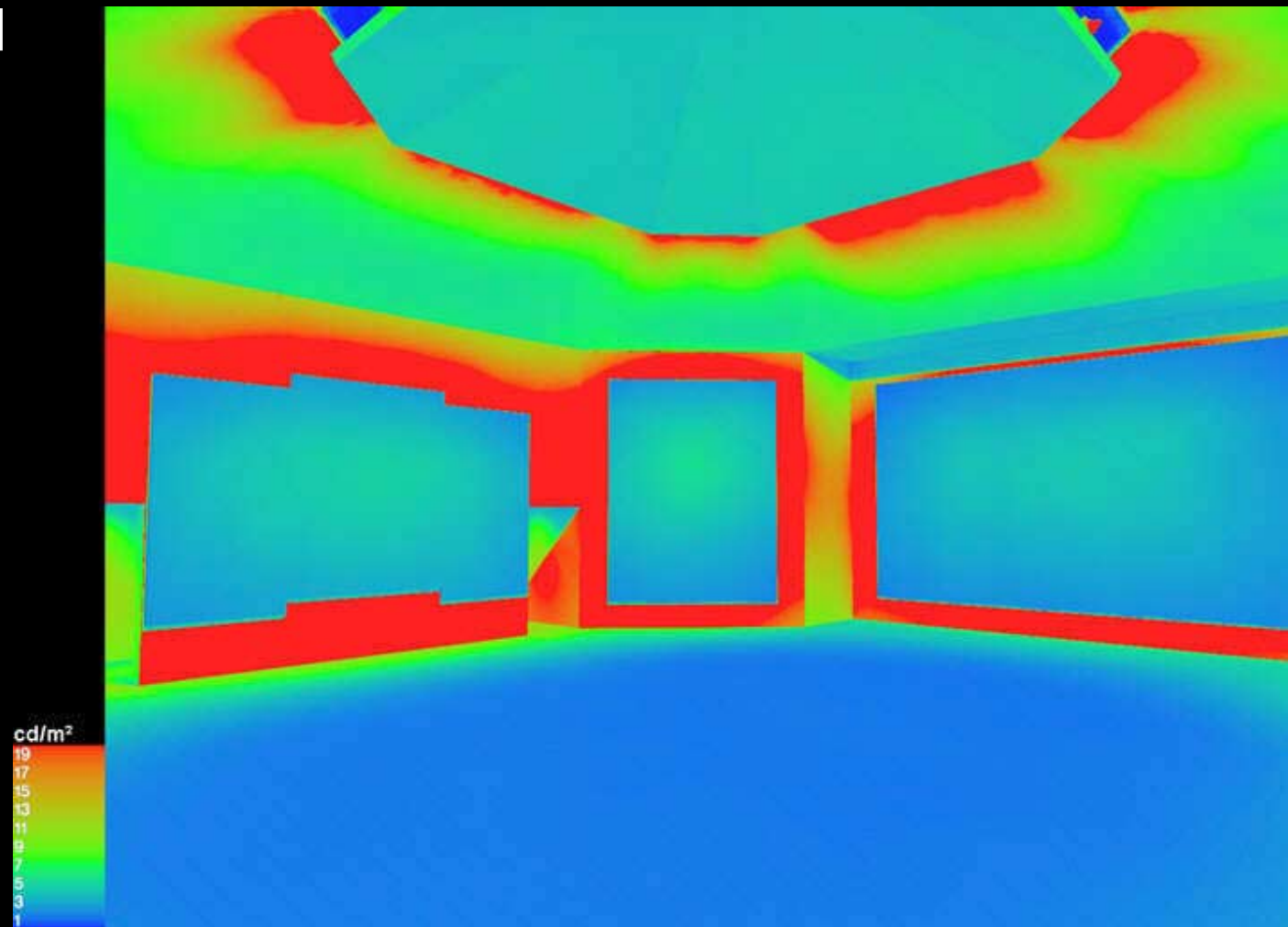
# Rothko Chapel

- **Revised Design**



# Rothko Chapel

- **Revised Design**



# Seattle Art Museum

- **Downtown Seattle, Washington**
- **Allied Works Architecture**
- **Addition to existing Venturi building, including high-rise tower**



# Seattle Art Museum





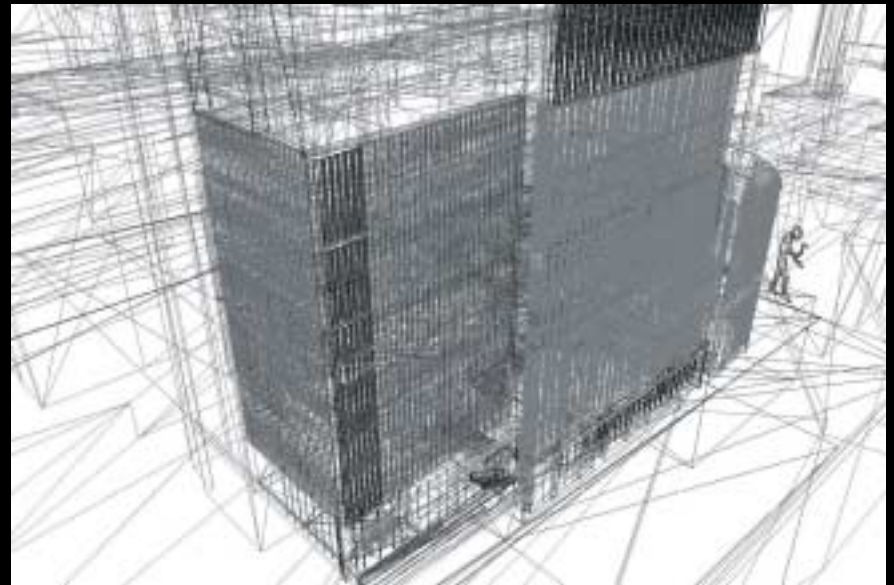
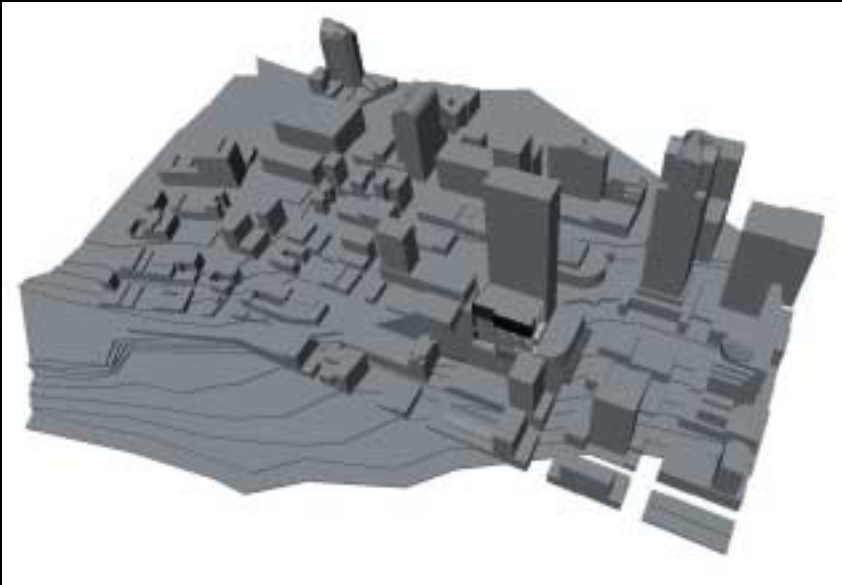
# Seattle Art Museum

The image is a detailed architectural floor plan of the Seattle Art Museum. The plan shows a complex arrangement of rooms, including galleries, a central atrium, and administrative spaces. Several large areas are highlighted in light blue, indicating the placement of lighting fixtures or specific lighting zones. The plan includes numerous labels for rooms and spaces, such as 'GALLERY 100', 'GALLERY 101', 'GALLERY 102', 'GALLERY 103', 'GALLERY 104', 'GALLERY 105', 'GALLERY 106', 'GALLERY 107', 'GALLERY 108', 'GALLERY 109', 'GALLERY 110', 'GALLERY 111', 'GALLERY 112', 'GALLERY 113', 'GALLERY 114', 'GALLERY 115', 'GALLERY 116', 'GALLERY 117', 'GALLERY 118', 'GALLERY 119', 'GALLERY 120', 'GALLERY 121', 'GALLERY 122', 'GALLERY 123', 'GALLERY 124', 'GALLERY 125', 'GALLERY 126', 'GALLERY 127', 'GALLERY 128', 'GALLERY 129', 'GALLERY 130', 'GALLERY 131', 'GALLERY 132', 'GALLERY 133', 'GALLERY 134', 'GALLERY 135', 'GALLERY 136', 'GALLERY 137', 'GALLERY 138', 'GALLERY 139', 'GALLERY 140', 'GALLERY 141', 'GALLERY 142', 'GALLERY 143', 'GALLERY 144', 'GALLERY 145', 'GALLERY 146', 'GALLERY 147', 'GALLERY 148', 'GALLERY 149', 'GALLERY 150', 'GALLERY 151', 'GALLERY 152', 'GALLERY 153', 'GALLERY 154', 'GALLERY 155', 'GALLERY 156', 'GALLERY 157', 'GALLERY 158', 'GALLERY 159', 'GALLERY 160', 'GALLERY 161', 'GALLERY 162', 'GALLERY 163', 'GALLERY 164', 'GALLERY 165', 'GALLERY 166', 'GALLERY 167', 'GALLERY 168', 'GALLERY 169', 'GALLERY 170', 'GALLERY 171', 'GALLERY 172', 'GALLERY 173', 'GALLERY 174', 'GALLERY 175', 'GALLERY 176', 'GALLERY 177', 'GALLERY 178', 'GALLERY 179', 'GALLERY 180', 'GALLERY 181', 'GALLERY 182', 'GALLERY 183', 'GALLERY 184', 'GALLERY 185', 'GALLERY 186', 'GALLERY 187', 'GALLERY 188', 'GALLERY 189', 'GALLERY 190', 'GALLERY 191', 'GALLERY 192', 'GALLERY 193', 'GALLERY 194', 'GALLERY 195', 'GALLERY 196', 'GALLERY 197', 'GALLERY 198', 'GALLERY 199', 'GALLERY 200'. The plan also shows various structural elements like walls, doors, and windows, as well as furniture and fixtures. The overall layout is designed to provide a clear and functional representation of the museum's interior spaces.

ArupLighting

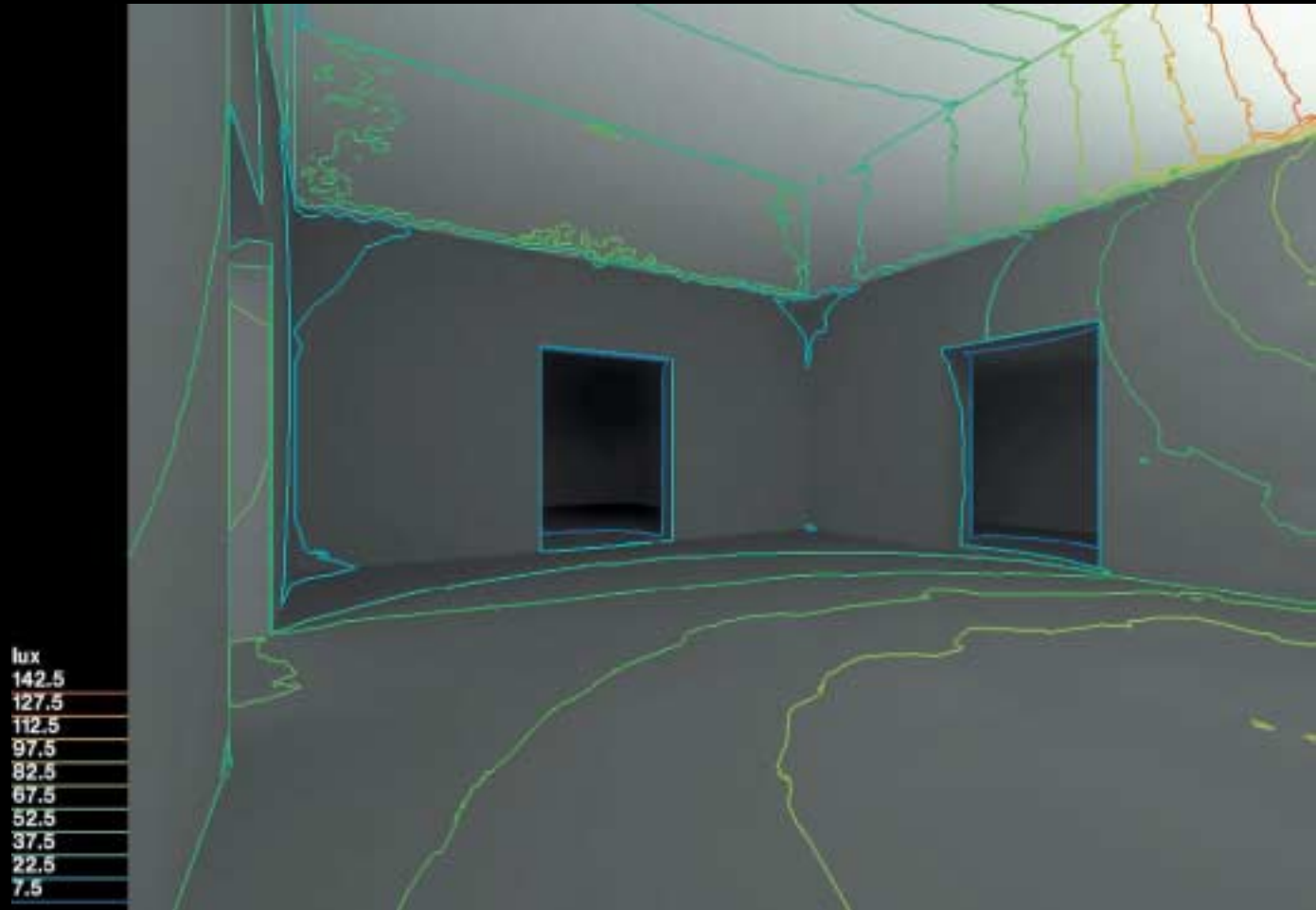
# Seattle Art Museum

- 3D model of site and building



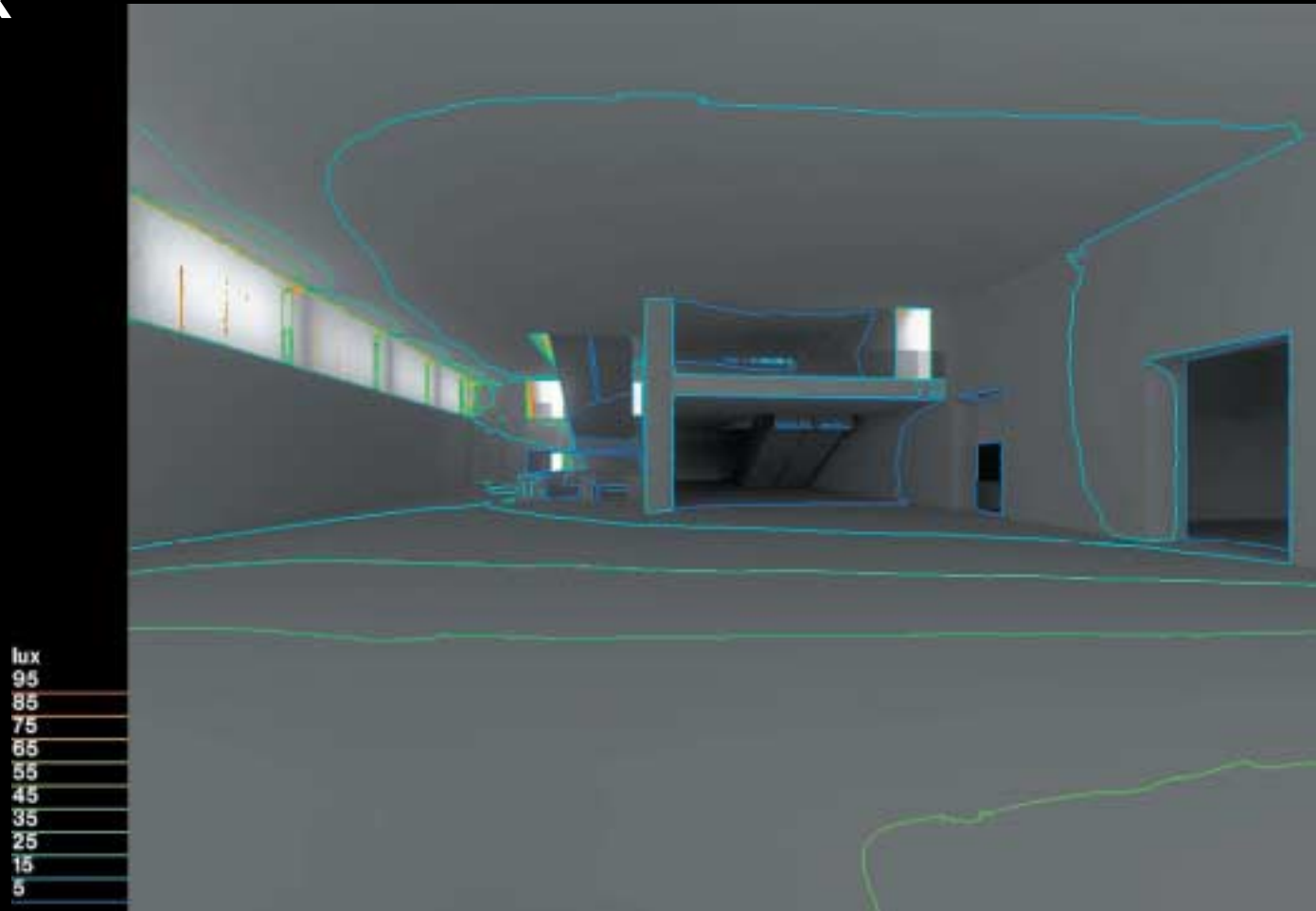
# Gallery Analysis

- **Top-lit**



# Gallery Analysis

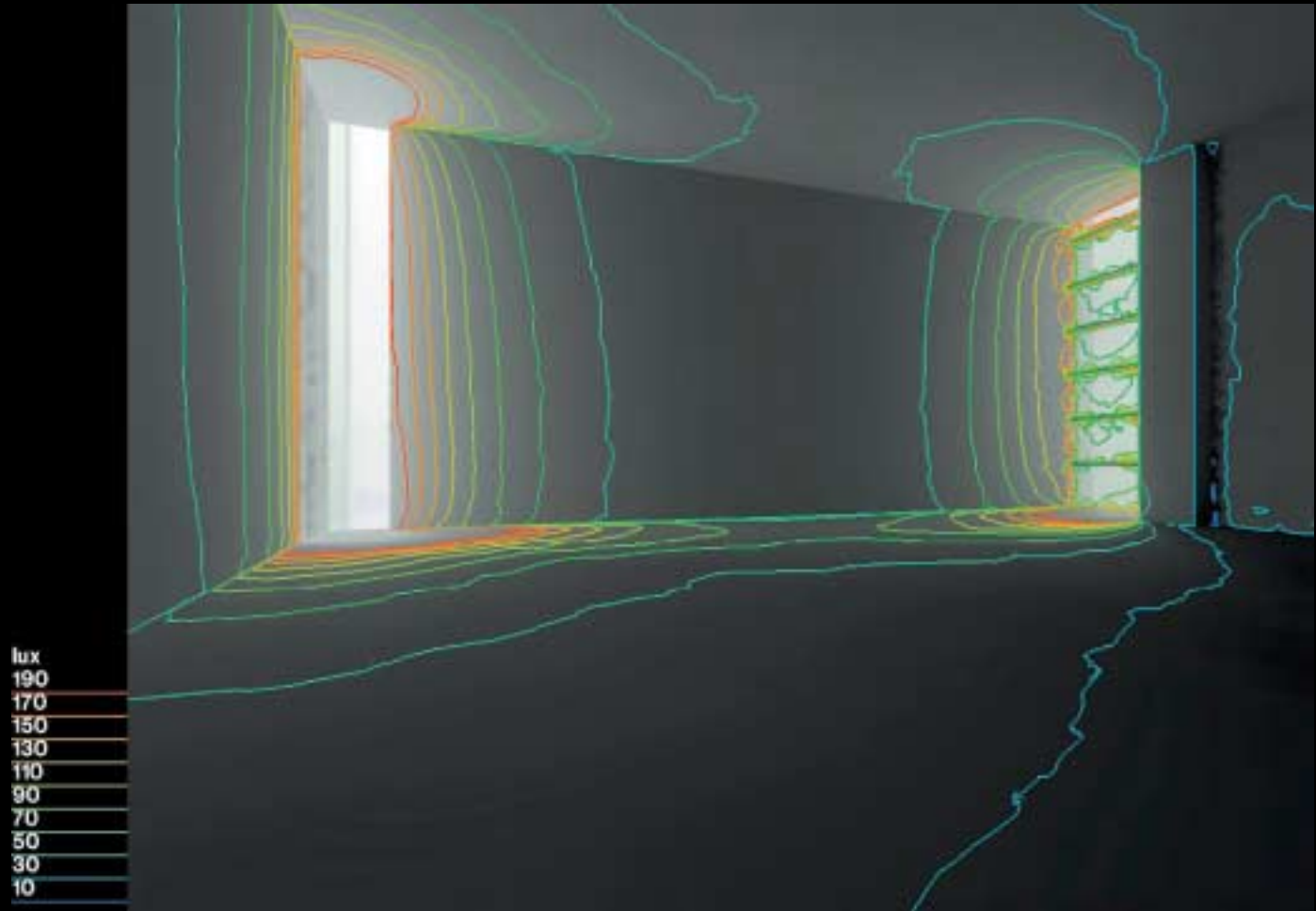
- **Lightbox**





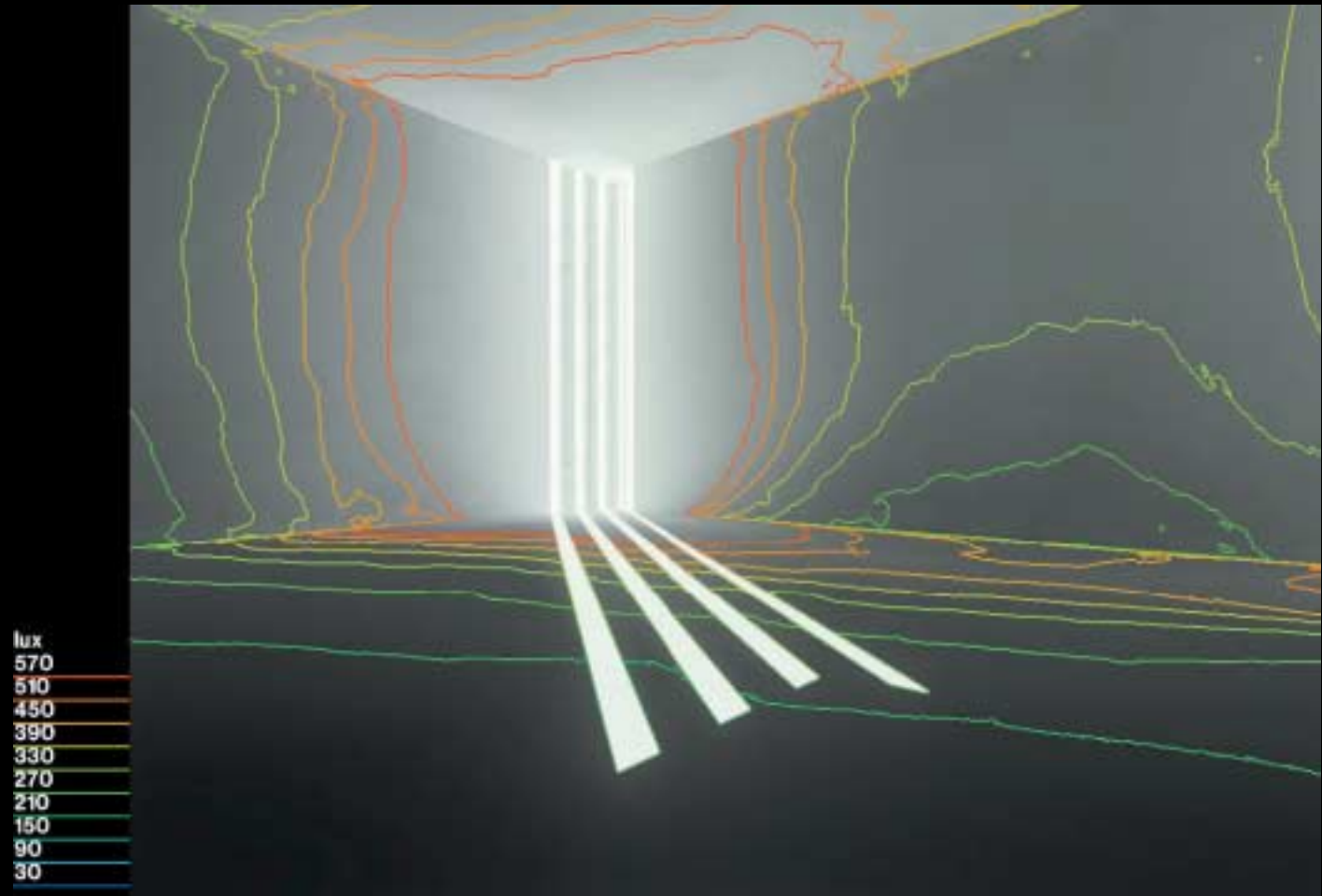
# Gallery Analysis

- **View  
gallery**



# Gallery Analysis

- View gallery



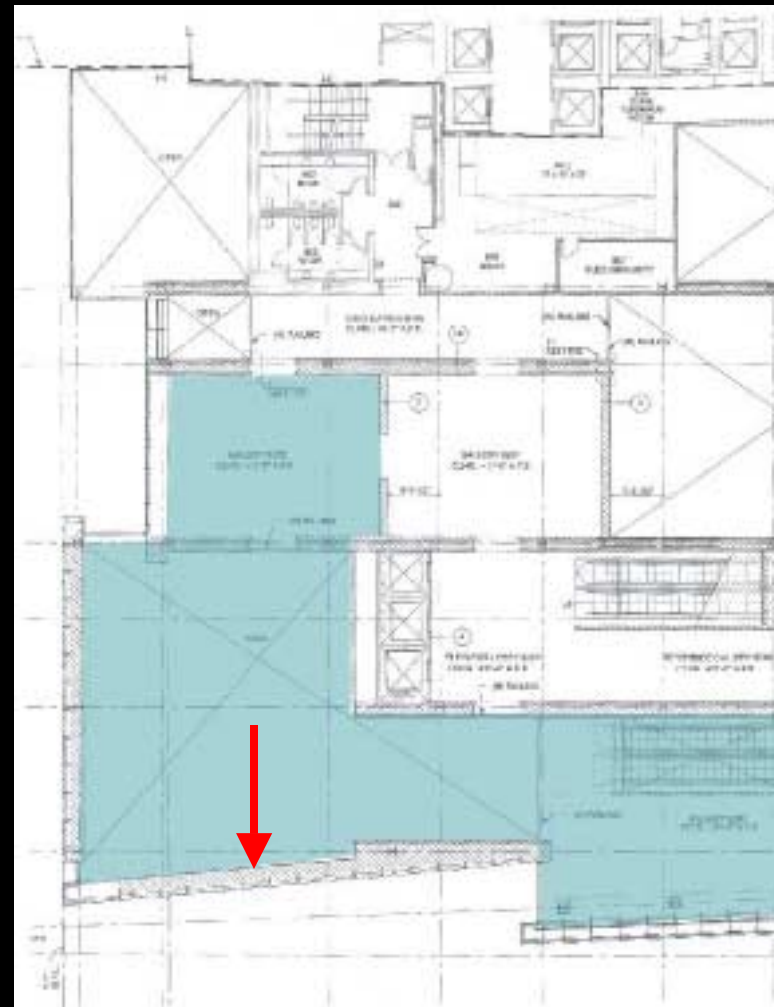
# Gallery Analysis

- Sidelit gallery

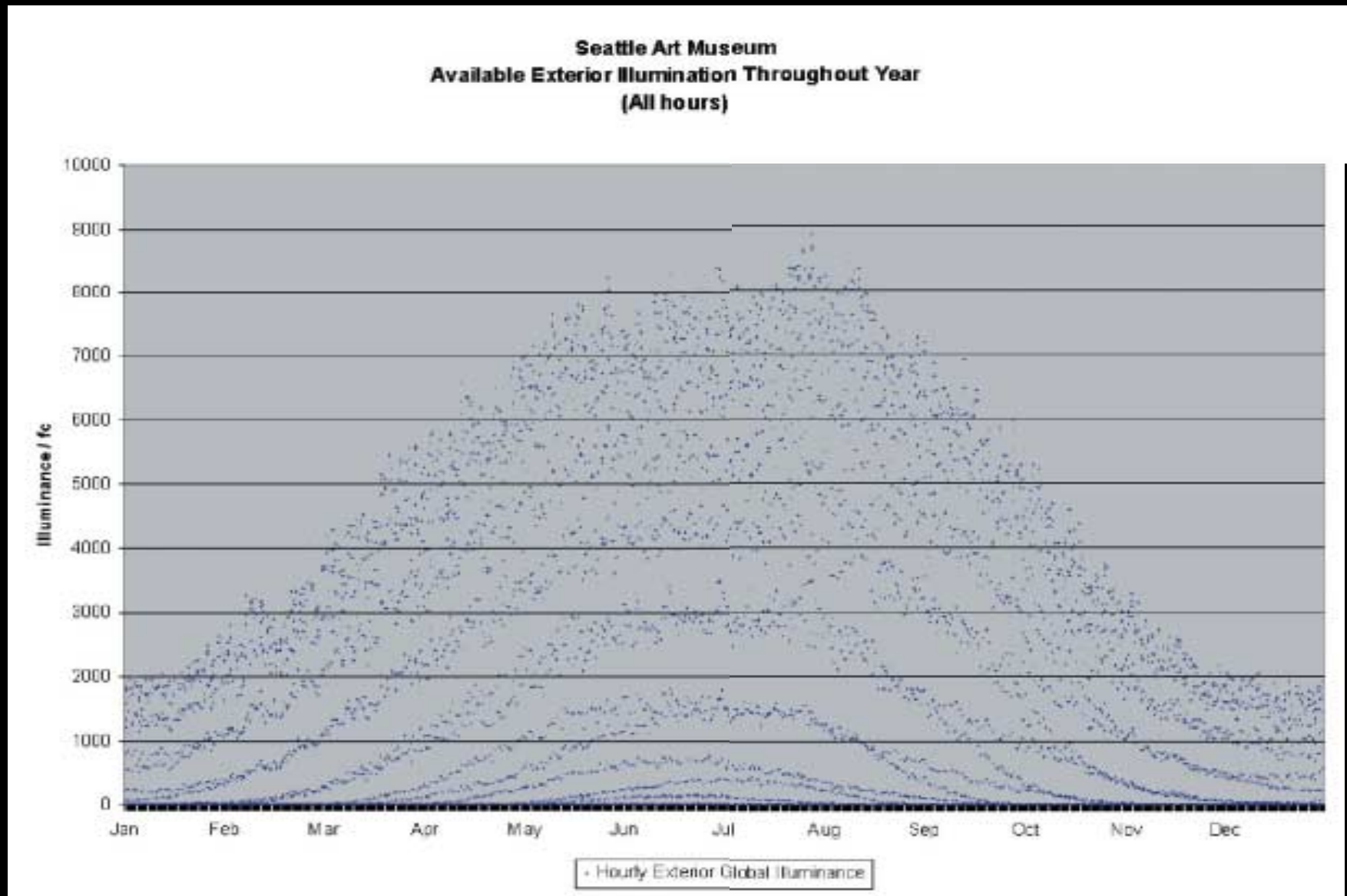


# Annual Exposure Study

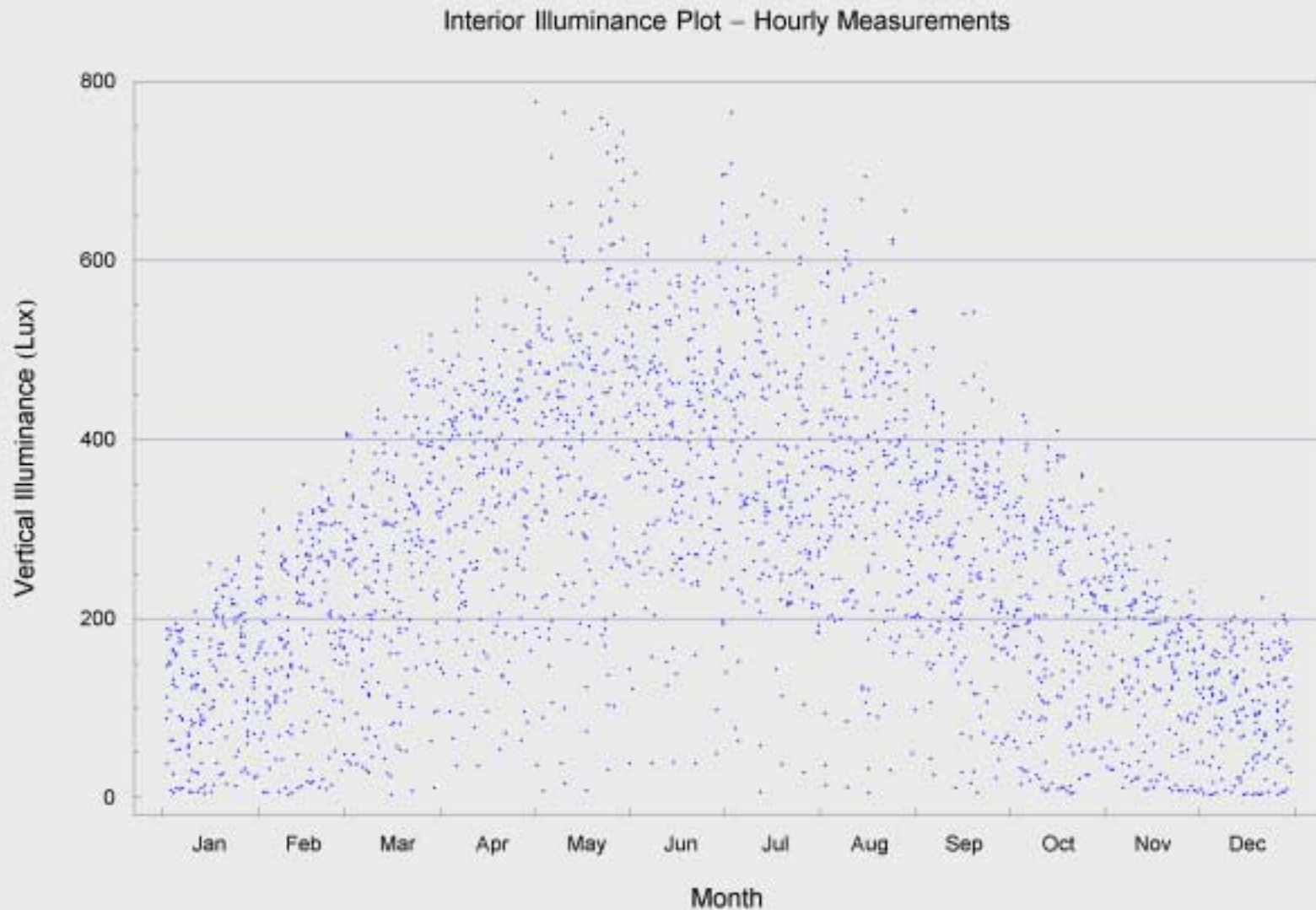
- Typical art hanging point in gallery
- Daysim add-in
- Hourly illuminance values for typical year



# Exterior Illuminance

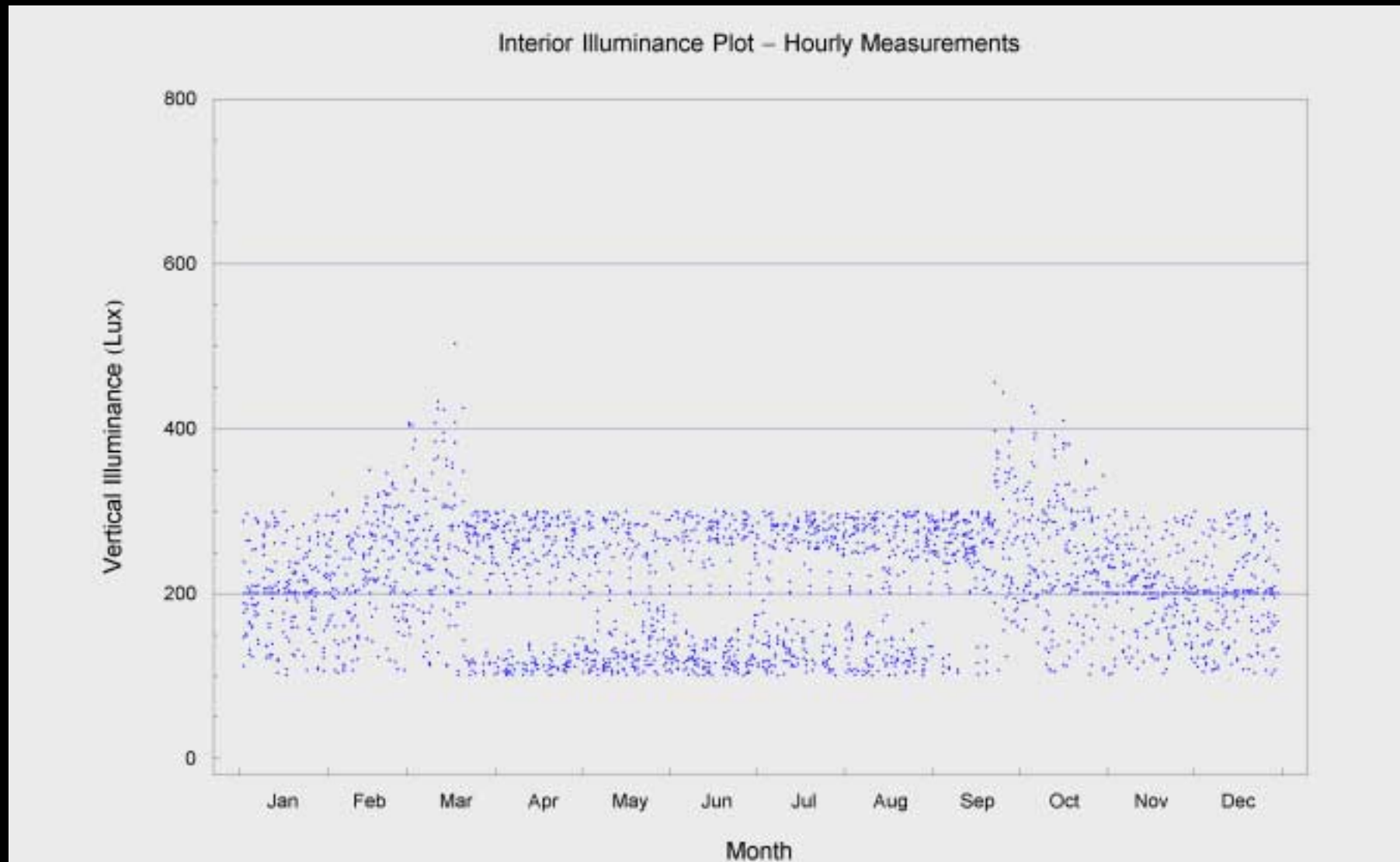


# Museum Open Hours - 1,500,000+ lux-hours

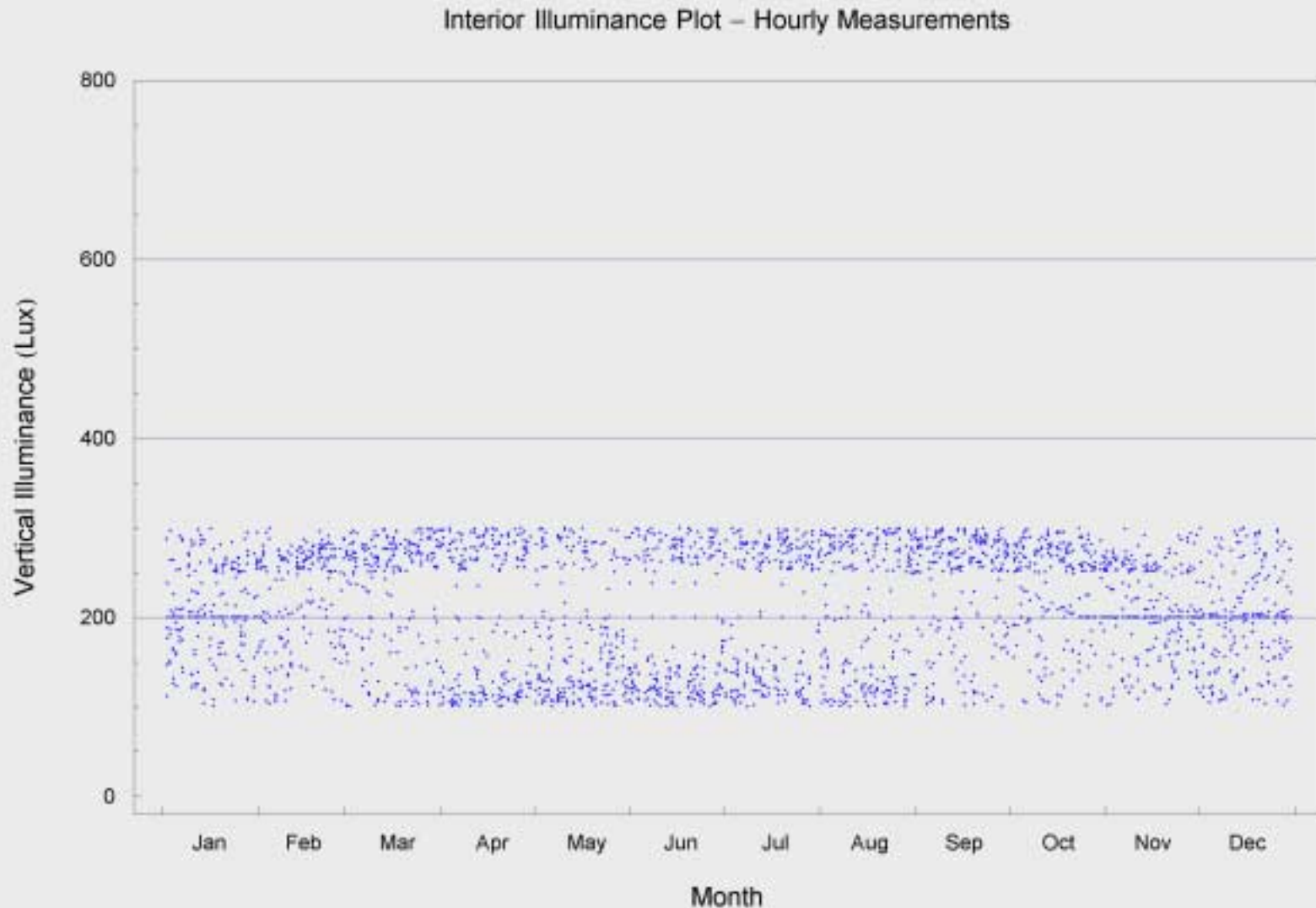




# Seasonal Shading + Switching - 569,000 lh

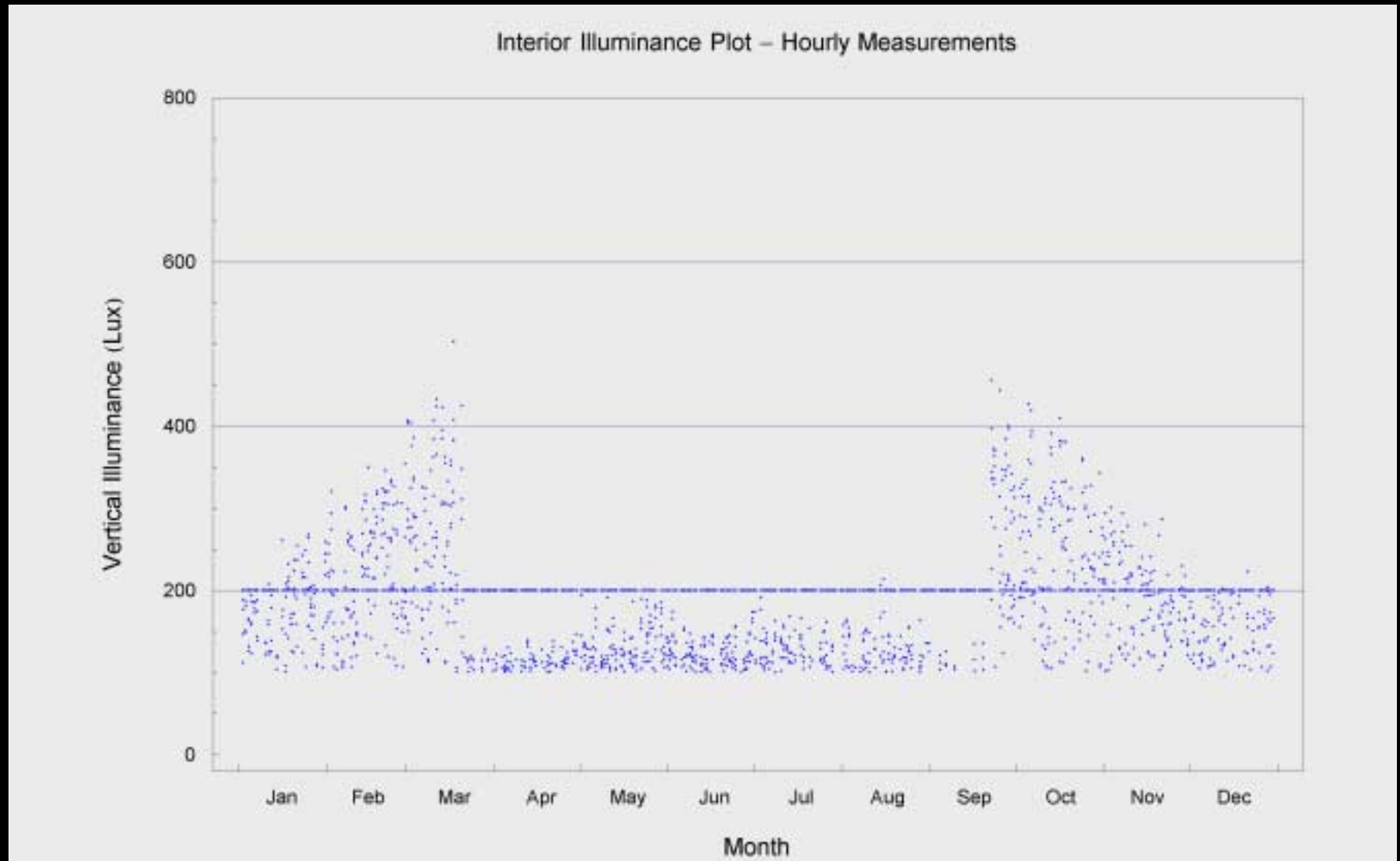


# Automatic Shading + Switching - 555,000 lh





# Seasonal Shading + Dimming - 501,000 lh



# Automatic Shading + Dimming - 464,000 Ih

